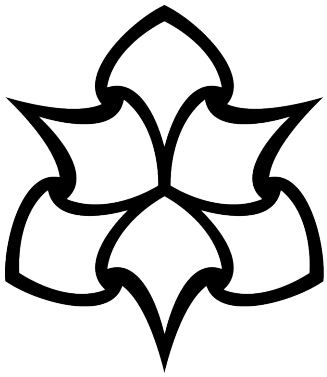
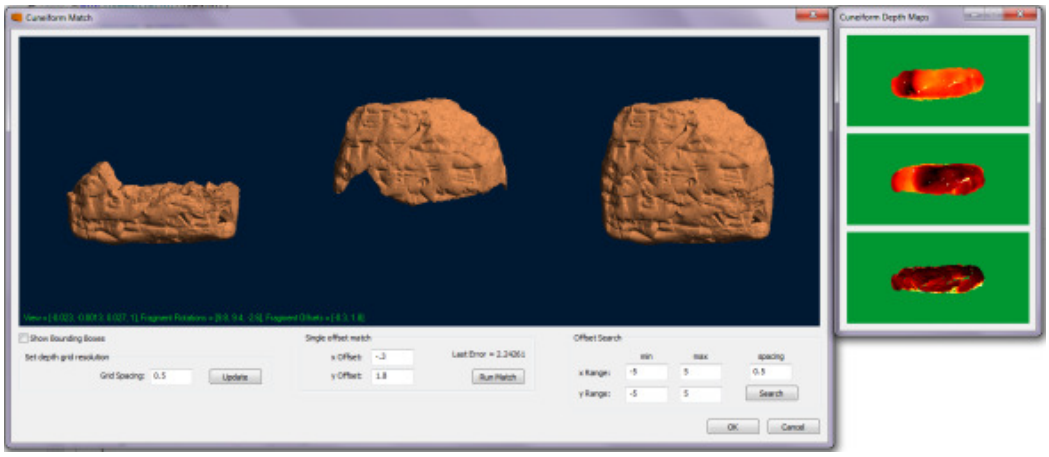


Automated Joining of Cuneiform Tablet Fragments

"A good start is half the battle", but not necessarily when trying to join a large number of fragments of clay tablets. Every Assyriologist who wants to publish a text corpus has to spend many months, if not even years, with the manual matching of the fragments, time which could be used more efficiently. For this reason a technical solution has long been sought for.

The results of a research project carried out with colleagues at The University of Birmingham, UK, have now provided that solution. The starting basis was that part of the Late Babylonian Eanna archive that is housed at Heidelberg University, Germany.[1)] Including also the smallest fragments the archive consists of 2658 pieces in total. If n fragments are given, the number of join possibilities is ½ n(n-1), in other words in this case 3,531,153. The manual check of all those possibilities would take approximately twenty years.

Using a database in which in addition to 3D scans all the important facts about the fragments are stored (date, size, script, ...) the designed algorithm starts, after the choice of a given scan, with the attempt to join in succession all of the other fragments. The technical details are elucidated in the article *Automated Reconstruction of Virtual Fragmented Cuneiform Tablets* by T. Collins *et al.*, Electronics Letters (IET; awaiting publication, 2014). The first success – a tablet joined without human involvement – is presented here:



The scan shows the Late Babylonian letter W 18349 + Wy777[2)]: "^{I}*Šu-la-*[*a šu-lum*] / *šá* ^{I}SUM-^{d}[DN] / ŠEŠ-*šú i-šá-lu* / *šá* ^{I}*Ba-ni-ia* / *u* ^{Id}+EN-NIGIN$^{?}$-*ir* GIŠ-*u*$^{!}$ / *mi-nam-ma* / (rest missing, traces preserved)" – "Šulā inquires about the well-being of Iddin-[DN], his brother. (As to) what Bānija and Bēl-upaḫḫir$^{?}$ carried away (= received), whatever ... ."

Our project was called into being under the title *A Collaborative Environment for Assisted 3D Reconstruction of Cuneiform Tablets* at the University of Birmingham.[3)] We received generous financial support from The Leverhulme Trust, UK (research grant number F000 94 BP). We should like in particular to thank Margarete van Ess (German Archaeological Institute, Berlin) for her continuous help. Without her permission to scan and to publish fragments of the Heidelberg collection the project could not have been completed. In the initial stage we were also supported by Michael Müller-Karpe (Romano-Germanic Central Museum, Mainz). For the data acquisition with the 3D scanner of the *Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences* at the *Interdisciplinary Center for Scientific Computing* (IWR), Heidelberg University, we would like to express our gratitude to Hubert Mara and Susanne Krömker. A very special thanks goes to Sonja Speck, IWR, who made the actual scans and took great care with the post-processing.

1) See E. Gehlken, AUWE 5 (R. M. Boehmer [ed.], Ausgrabungen in Uruk-Warka, Endberichte, vol. 5), p. 6–7.

2) The philological publication will be given in AUWE 27 (for GIŠ see H. Freydank, Spätbabylonische Wirtschaftstexte aus Uruk [Berlin 1971], p. 34); size (in cm): 3.3 x 2.6 x 1.0. The surface of the reverse is for the most part flaked off.

3) A detailed project history and a list of all collaborators will be published later, but Andrew Lewis and Luis Hernandez Munoz (both of them at The University of Birmingham) should be mentioned here.

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